# Violence and Substance Use among North Carolina Pregnant Women


## ABSTRACT

*Objectives.* Prenatal patients were studied to examine the proportion of women who had been violence victims, women's patterns of substance use (cigarettes, alcohol, and illegal drugs) before and during pregnancy, and relationships between violence and substance use.

*Methods.* More than 2000 prenatal patients in North Carolina were screened for violence and substance use. Relationships between violence and patterns of substance use before and during pregnancy were examined, as well as women's continuation of substance use during pregnancy as a function of violence and sociodemographic factors.

*Results.* Twenty-six percent of the women had been violence victims during their lives. Before pregnancy, 62% of the women had used one or more substances; during pregnancy, 31% had used one or more substances. Both before and during pregnancy, violence victims were significantly more likely to use multiple substances than nonvictims. Continuation of substance use during pregnancy was significantly more likely among violence victims than nonvictims.

*Conclusions.* Care providers should screen women for violence as well as for substance use and should ensure that women are provided with appropriate interventions. (*Am J Public Health.* 1996;86:991–998)



*Sandra L. Martin, PhD, Kathleen T. English, MSW, MPH, Kathryn Andersen Clark, MS, Dorothy Cilenti, MSW, MPH, and Lawrence L. Kupper, PhD*


## Introduction

Many women are victims of violence, even during pregnancy.[1] Studies estimate that 4% to 26% of prenatal patients were violence victims before their current pregnancy and that 1% to 17% experience violence during pregnancy.[2–17]

Violence is an important health problem, not only because of the physical injury that may result but also because of potentially harmful health behaviors that may be triggered in response to violence, such as substance use (defined here as the use of cigarettes, alcohol, and/or illegal drugs). Although the potential cause–effect relationship between violence and substance use has not been fully elucidated, there are indications that women in violent situations may use substances to cope with the stress and pain resulting from violence.[18–21]

Violence and substance use threaten the health of pregnant women[22–26] and their unborn children.[27–32] Violence during pregnancy has been tied to negative birth outcomes[27–28]; cigarette use has been related to low birthweight, spontaneous abortion, and sudden infant death syndrome[29]; and alcohol use may result in fetal alcohol syndrome, a major cause of mental retardation.[31] Some studies have found associations between illegal drug use during pregnancy and poor birth outcomes, with cocaine use being related to intrauterine growth retardation and congenital defects,[30] and marijuana use being associated with precipitous labor, short infant birth length, and low birthweight.[29] Mental trauma due to violence[33] may impair a woman's ability to provide child care once her baby is born. Similarly, women who use high levels of substances after delivery may place their children at increased risk because their abuse of alcohol and drugs may interfere with their parenting skills[34] and passive cigarette-smoke exposure may lead to children's respiratory problems.[35]

Some research has examined possible links between violence and substance use among pregnant populations. A Virginia study found that obstetric patients who had been violence victims at some point in their lifetimes were more likely than nonvictims to use cigarettes and alcohol; however, violence was not significantly related to drug use.[2] A Texas study of prenatal patients found that violence victims were more likely than nonvictims to use cigarettes, alcohol, and illegal drugs.[6] An Appalachian study found that women abused during pregnancy were significantly more likely than nonabused women to use cigarettes and alcohol during pregnancy,[13] while a Canadian study reported that women physically abused during pregnancy were significantly more likely than nonabused women to use cigarettes, alcohol, and illegal drugs regularly.[12] A Boston study showed that women experiencing violence during pregnancy were more likely than nonvictims to be heavy alcohol users,[5] while a study of


Sandra L. Martin is with the Department of Maternal and Child Health, and Kathryn Andersen Clark and Lawrence L. Kupper are with the Department of Biostatistics, University of North Carolina at Chapel Hill. Kathleen T. English is with the Substance Abuse Treatment Center, Department of Psychiatry, University of Vermont, Burlington. Dorothy Cilenti is with the Maternal and Child Health Division, Wake County Health Department, Raleigh, NC.

Requests for reprints should be sent to Sandra L. Martin, PhD, Department of Maternal and Child Health, School of Public Health, CB #7400, University of North Carolina, Chapel Hill, NC 27599-7400.



This paper was accepted October 18, 1995.

more than 400 recently postpartum women from five midwestern hospitals found that women who were battered during pregnancy were more likely than nonbattered women to be heavy alcohol and drug users.[15] Finally, studies of pregnant teens in California and Texas found that violence victims were more likely than nonvictims to use cigarettes, alcohol, and illegal drugs before pregnancy.[7,36] The few inconsistencies in these study findings may be due to varying methodologies (different definitions of violence, different sample characteristics, use or nonuse of multivariable analyses, etc.); however, taken together, these findings suggest links between prenatal patients' experiences with violence and their use of substances.

This paper extends past research by examining associations between violence and substance use in North Carolina prenatal patients. In addition to examining relationships between violence and particular types of substance use (cigarettes, alcohol, or drugs), this study examines the association between violence and various patterns of substance use (defined here as the use of one, two, or all three types of substances under study in this report). It is important to examine patterns of substance use since the use of multiple substances is common among women and may, during pregnancy, have a cumulatively detrimental effect on the developing fetus.[37]

The following research questions are addressed: (1) What proportion of prenatal patients have been victims of violence during their lifetimes? (2) What patterns of substance use are exhibited by these women before and during pregnancy? (3) Is being a violence victim related to women's patterns of substance use before and during pregnancy? (4) Among women who used substances before pregnancy, is being a violence victim associated with a continuation of substance use during pregnancy?

## Methods

### *Sample Selection*

This study was undertaken as part of an evaluation of a multidisciplinary prenatal care program. All 3143 prenatal patients of a North Carolina health department who were seen over a 21-month period and were between 20 and 39 years old were eligible for study. Complete information was available for 2092 (67%) of the women. Comparison of these women with those for whom complete information was unavailable found no differences in sociodemographic characteristics. Therefore, this paper focuses on the 2092 women with complete information.

### *Assessment*

As part of clinical practice, health care providers from the study health department screen all prenatal patients during their initial prenatal visit to determine whether the women need specialized services. This structured screening collects information concerning health, sociodemographic characteristics, substance use, and experiences of violence. This clinical information is entered into the patients' charts, and treatment plans are developed. Then, patient names are removed and the information is passed to the clinic's quality assurance evaluation team.

During screening, women's use of substances is assessed by questions concerning cigarette, alcohol, and illegal drug use. For analysis purposes in this study, women were classified as smoking before pregnancy if they reported usually smoking one or more cigarettes per day the year before pregnancy, and they were classified as smoking during pregnancy if they reported usually smoking one or more cigarettes per day during pregnancy. Among smokers, women smoking 20 or more cigarettes per day were classified as frequent smokers. Women were classified as drinking alcohol before pregnancy if they reported having one or more alcoholic drinks the year before pregnancy, and they were classified as drinking alcohol during pregnancy if they reported having one or more alcoholic drinks during pregnancy. Among drinkers, women who drank once a week or more were classified as frequent drinkers. Women were classified as using drugs before pregnancy if they reported using an illegal drug one or more times the year before pregnancy, and they were classified as using drugs during pregnancy if they reported using an illegal drug one or more times during pregnancy. Among drug users, women who used drugs once a week or more were classified as frequent drug users.

For analysis purposes, each woman was classified into one of four groups depending on her pattern of substance use before pregnancy: (1) use of no substances; (2) use of one substance (either cigarettes, alcohol, or drugs); (3) use of two substances (some combination of cigarettes, alcohol, or drugs); and (4) use of all three substances (cigarettes, alcohol, and drugs). Similarly, women were classified into one of these four groups on the basis of their pattern of substance use during pregnancy.

Women's experiences with violence were assessed using physical abuse questions from the Abuse Assessment Screen.[8] Women were asked whether they had ever been hit, slapped, kicked, or otherwise physically hurt by someone. They also were asked if violence had occurred during the current pregnancy. For analysis purposes, women were classified as violence victims if they reported experiencing violence before and/or during the current pregnancy. Violence victims were asked to identify the social relationship of the perpetrator to themselves (current husband, etc.).

### *Analysis*

Crude (unadjusted) odds ratios (ORs) and 95% confidence intervals (CIs) were used to examine bivariate relationships between the dichotomous violence variable and each of the dichotomous variables indexing women's use of cigarettes, alcohol, and drugs both before and during pregnancy. Similar procedures were used to examine how the women's cigarette, alcohol, and drug use related to their sociodemographic characteristics (ethnicity, education, age, previous children, and trimester in which prenatal care began).

The crude association between violence and the ordinal variable indexing membership in one of the four prepregnancy substance use groups was examined with the ANOVA/Cochran-Mantel-Haenszel test statistic.[38] Similar procedures were used to examine patterns of substance use before pregnancy by sociodemographic characteristics. Ordinal logistic regression with a cumulative odds model[39] was used to quantify the effect of violence on membership in one of the four prepregnancy substance use groups while controlling for sociodemographic factors. An estimated odds ratio and 95% confidence interval were computed to assess the association between violence and the tendency toward more severe patterns of substance use (ie, the likelihood of using multiple substances) before pregnancy while controlling for sociodemographic factors. Similar procedures were used to examine the association between violence and women's patterns of substance use during pregnancy.

A crude odds ratio and 95% confidence interval were used to examine the

bivariate relationship between violence and the continuation of substance use during pregnancy among women who used at least one substance before pregnancy. Similar procedures were used to examine sociodemographic characteristics related to the continuation of substance use during pregnancy. Logistic regression analysis was used to model the continuation of substance use during pregnancy as a function of violence and sociodemographic characteristics. The adjusted odds ratio and 95% confidence interval, quantifying the relationship of violence to the continuation of substance use, were computed.

**TABLE 1—Number and Type of Substances Used before and during Pregnancy by North Carolina Prenatal Patients (n = 2092)**

| No. and Type of Substances Used | Before Pregnancy | | During Pregnancy | |
|---|---|---|---|---|
| | No. | % | No. | % |
| No substance | 802 | 38 | 1449 | 69 |
| One substance | 643 | 31 | 505 | 24 |
| Cigarettes | 211 | 10 | 435 | 21 |
| Alcohol | 424 | 20 | 62 | 3 |
| Drugs | 8 | <1 | 8 | <1 |
| Two substances | 457 | 22 | 105 | 5 |
| Cigarettes and alcohol | 386 | 18 | 68 | 3 |
| Cigarettes and drugs | 23 | 1 | 31 | 1 |
| Alcohol and drugs | 48 | 2 | 6 | <1 |
| Three substances | 190 | 9 | 33 | 2 |

## *Results*

### *Women's Characteristics*

Of the 2092 women, 1142 (55%) were African American, 736 (35%) were non-Hispanic White, and 214 (10%) were of other ethnicities. They ranged from 20 to 39 years of age (mean = 25.9, SD = 4.5), all the women were Medicaid eligible, 1304 (62%) had children, and 1634 (78%) were high school graduates. One thousand seventy-one women (51%) began prenatal care in the first trimester of pregnancy, 792 (38%) began in the second, and 229 (11%) began in the third.

### *Violence Exposure*

Five hundred fifty women (26%) reported being a victim of violence at some time in their lives. In more than half of these cases, the perpetrator was the woman's ex-husband or boyfriend; in more than a quarter of them, it was the woman's current husband or boyfriend. Four hundred eighty-six women (23%) had experienced violence only before the current pregnancy, 49 (2%) had experienced violence both before and during the current pregnancy, and 15 (<1%) had experienced violence only during the current pregnancy. Violence during pregnancy was strongly associated with violence before pregnancy (OR = 10.36; 95% CI = 5.76, 18.65).

### *Substance Use before Pregnancy*

Before pregnancy, 810 (39%) women smoked cigarettes, 1048 (50%) drank alcohol, and 269 (13%) used drugs; of this last group, 224 (11%) used marijuana, 103 (5%) used cocaine, and 35 (2%) used other drugs. Frequent use characterized 53% of the smokers, 34% of the drinkers, and 47% of the drug users.

Table 1 shows that many women used more than one substance before pregnancy. Smoking before pregnancy was positively associated with drinking before pregnancy (OR = 4.22; 95% CI = 3.50, 5.11) and drug use before pregnancy (OR = 7.81; 95% CI = 5.73, 10.65), and alcohol use before pregnancy was positively associated with drug use before pregnancy (OR = 9.60; 95% CI = 6.53, 14.12).

### *Substance Use during Pregnancy*

Substance use changed dramatically during pregnancy, with many women quitting substance use, especially alcohol. Very few women who had not used substances before pregnancy became substance users during pregnancy; of those who did, two started smoking, five started drinking, and three started using drugs. During pregnancy, 567 (27%) women smoked, 169 (8%) drank alcohol, and 78 (4%) used drugs; of this last group, 49 (2%) used marijuana, 38 (2%) used cocaine, and 8 (<1%) used other drugs. Frequent use characterized 18% of the smokers, 27% of the drinkers, and 38% of the drug users.

Table 1 shows that some women used more than one type of substance during pregnancy. Smoking during pregnancy was positively associated with drinking during pregnancy (OR = 4.64; 95% CI = 3.36, 6.43) and using drugs during pregnancy (OR = 13.73; 95% CI = 7.64, 24.70), and alcohol and drug use during pregnancy also were positively associated (OR = 14.49; 95% CI = 8.99, 23.38).

### *Violence Related to Substance Use before Pregnancy*

Crude (unadjusted) bivariate associations between violence and specific types of substance use before pregnancy showed that, compared with nonvictims, victims of violence were significantly more likely to smoke (59% vs 32%; OR = 3.08; 95% CI = 2.52, 3.77), to drink (64% vs 45%; OR = 2.16; 95% CI = 1.77, 2.64), and to use drugs before pregnancy (23% vs 9%; OR = 3.01; 95% CI = 2.32, 3.92). Cigarette use before pregnancy was significantly related to ethnicity, with African Americans being less likely to smoke (OR = 0.58; 95% CI = 0.49, 0.69); to education, with high school graduates being less likely to smoke (OR = 0.53; 95% CI = 0.43, 0.65); and to age, with younger women being less likely to smoke (OR = 0.78; 95% CI = 0.63, 0.97). Alcohol use before pregnancy was significantly related to previously having children, with women with children being less likely to drink (OR = 0.64; 95% CI = 0.53, 0.76); and drug use before pregnancy was significantly related to education, with high school graduates being less likely to use drugs (OR = 0.72; 95% CI = 0.54, 0.96).

To examine whether the frequency with which women used various types of substances before pregnancy was related to violence, analyses were undertaken focusing exclusively on women who used substances before pregnancy. Among those who smoked before pregnancy, violence victims were significantly more likely than nonvictims to be frequent cigarette users (59% vs 50%; OR = 1.50; 95% CI = 1.13, 1.99). Similarly, among those who drank alcohol before pregnancy, victims were significantly more likely than nonvictims to be frequent drinkers (42% vs 30%; OR = 1.64; 95% CI = 1.26, 2.14). However, among those who used drugs before pregnancy, victims were not significantly more likely than

**TABLE 2—Characteristics of Women (n = 2092) Using Various Numbers of Types of Substances before Pregnancy, by Violence and Sociodemographic Characteristics**

| | No. Substances | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0[a] | | 1[a] | | 2[a] | | 3[a] | | |
| | No. | % | No. | % | No. | % | No. | % | P[b] |
| Violence victim | | | | | | | | | <.001 |
| Yes | 120 | 22 | 153 | 28 | 181 | 33 | 96 | 17 | |
| No | 682 | 44 | 490 | 32 | 276 | 18 | 94 | 6 | |
| Ethnicity | | | | | | | | | .025 |
| African American | 457 | 40 | 363 | 32 | 218 | 19 | 104 | 9 | |
| Other | 345 | 36 | 280 | 30 | 239 | 25 | 86 | 9 | |
| Education | | | | | | | | | <.001 |
| High school graduate | 647 | 40 | 516 | 32 | 334 | 20 | 137 | 8 | |
| Nongraduate | 155 | 34 | 127 | 28 | 123 | 27 | 53 | 11 | |
| Age | | | | | | | | | .618 |
| 20–29 | 644 | 38 | 516 | 31 | 362 | 22 | 151 | 9 | |
| 30–39 | 158 | 38 | 127 | 30 | 95 | 23 | 39 | 9 | |
| Children | | | | | | | | | .004 |
| Yes | 526 | 40 | 394 | 30 | 283 | 22 | 101 | 8 | |
| No | 276 | 35 | 249 | 32 | 174 | 22 | 89 | 11 | |
| Trimester prenatal care began | | | | | | | | | .657 |
| First | 408 | 38 | 346 | 32 | 228 | 21 | 89 | 8 | |
| Second | 311 | 39 | 228 | 29 | 174 | 22 | 79 | 10 | |
| Third | 83 | 36 | 69 | 30 | 55 | 24 | 22 | 10 | |

[a]0 = did not use cigarettes, alcohol, or drugs; 1 = used cigarettes, alcohol, or drugs; 2 = used cigarettes and alcohol, cigarettes and drugs, or alcohol and drugs; 3 = used cigarettes, alcohol and drugs.
[b]P value of ANOVA/Cochran-Mantel-Haenszel statistic.

nonvictims to be frequent drug users (48% vs 46%; OR = 1.21; 95% CI = 0.69, 1.83).

Table 2 presents crude bivariate associations between the number of substances used before pregnancy (zero, one, two, or three) and both violence and sociodemographic characteristics. The ANOVA/Cochran-Mantel-Haenszel statistic shows a significant association between violence and the number of substances used before pregnancy, with violence victims tending to use greater numbers of substances than nonvictims ($P < .001$). Significant differences in the number of substances used before pregnancy also were found by ethnicity, education, and previous childbirth.

A cumulative odds model was fit using ordinal logistic regression to assess the association between the number of substances used before pregnancy and violence, controlling for sociodemographic factors. This analysis resulted in essentially equal estimated odds ratios for the three possible groupings of the outcome (zero substances vs one, two, or three; zero or one substance vs two or three; and zero, one, or two substances vs three); thus, the proportional odds assumption held. Model-fitting results in Table 3 show that before pregnancy, violence victims were significantly more likely than nonvictims to be in the more severe substance use categories, controlling for sociodemographic factors (OR = 3.02; 95% CI = 2.51, 3.62). Statistically significant effects also were found for education, with high school graduates being less likely to be in the more severe categories; for age, with older women being more likely to be in the more severe categories; and for previous childbirth, with women with children being less likely to be in the more severe categories.

### *Violence Related to Substance Use during Pregnancy*

Crude bivariate associations between violence and the use of specific types of substances during pregnancy showed that, compared with nonvictims, violence victims were significantly more likely to smoke (46% vs 20%; OR = 3.26; 95% CI = 2.64, 4.01), to drink (14% vs 6%; OR = 2.64; 95% CI = 1.91, 3.63), and to use drugs during pregnancy (8% vs 2%; OR = 3.46; 95% CI = 2.19, 5.46). Cigarette smoking during pregnancy was significantly related to ethnicity, with African Americans being less likely to smoke (OR = 0.59; 95% CI = 0.48, 0.71); to education, with high school graduates being less likely to smoke (OR = 0.48; 95% CI = 0.39, 0.60); to age, with younger women being less likely to smoke (OR = 0.65; 95% CI = 0.51, 0.81); to previous childbirth, with women with children being more likely to smoke (OR = 1.52; 95% CI = 1.24, 1.87); and to trimester in which prenatal care began, with women who started prenatal care later being more likely to smoke (ANOVA/Cochran-Mantel-Haenszel = 9.63, $P = .0008$). Alcohol use during pregnancy was significantly related to ethnicity, with African Americans being more likely to drink (OR = 1.48; 95% CI = 1.07, 2.05); to education, with high school graduates being less likely to drink (OR = 0.60; 95% CI = 0.43, 0.85); to age, with younger women being less likely to drink (OR = 0.55; 95% CI = 0.39, 0.78); to previous childbirth, with women with children being more likely to drink (OR = 1.63; 95% CI = 1.15, 2.31); and to trimester in which prenatal care began, with women who started prenatal care later being more likely to drink (ANOVA/Cochran-Mantel-Haenszel = 41.16, $P < .0001$). Drug use during pregnancy was significantly related to ethnicity, with African Americans being more likely to use drugs (OR = 3.46; 95% CI = 2.19, 5.46), and to trimester in which prenatal care began, with women who started prenatal care later being more likely to use drugs (ANOVA/Cochran-Mantel-Haenszel = 23.83, $P < .0001$).

To examine whether the frequency with which women used specific types of substances during pregnancy was related to violence, analyses were undertaken focusing exclusively on women who used substances during pregnancy. Among those who smoked during pregnancy, violence victims were significantly more likely than nonvictims to be frequent cigarette users (22% vs 15%; OR = 1.60; 95% CI = 1.05, 2.46). Similarly, among those who used drugs during pregnancy, violence victims were more likely than nonvictims to be frequent drug users although this relationship was of borderline statistical significance (49% vs 29%; OR = 2.29; 95% CI = 0.88, 5.95). However, among those who drank during pregnancy, victims were not significantly more likely than nonvictims to be fre-

**TABLE 3—Results of the Ordinal Logistic Regression Models of the Number of Substances Used by Women (n = 2092) before and during Pregnancy**

| | Before Pregnancy[a] | | | During Pregnancy[a] | | |
|---|---|---|---|---|---|---|
| | Parameter Estimate | Standard Error | AOR (95% CI)[b] | Parameter Estimate | Standard Error | AOR (95% CI)[b] |
| Violence victim | 1.1044 | 0.0931 | 3.02 (2.51, 3.62) | 1.1891 | 0.1036 | 3.28 (2.68, 4.02) |
| Ethnicity | −0.0899 | 0.0815 | 0.91 (0.78, 1.07) | −0.2792 | 0.0987 | 0.76 (0.62, 0.92) |
| Education | −0.3336 | 0.1000 | 0.72 (0.59, 0.87) | −0.5921 | 0.1143 | 0.55 (0.44, 0.69) |
| Age | 0.0199 | 0.0094 | 1.02 (1.01, 1.04) | 0.0587 | 0.0111 | 1.06 (1.04, 1.08) |
| Children | −0.3955 | 0.0886 | 0.67 (0.57, 0.80) | 0.1749 | 0.1096 | 1.19 (0.96, 1.48) |
| Trimester prenatal care began | 0.0718 | 0.0601 | 1.07 (0.96, 1.21) | 0.3498 | 0.0714 | 1.42 (1.23, 1.63) |

*Note.* The following coding scheme was used for the predictor variables in these analyses: violence (1 = yes, 0 = otherwise), age (in years), ethnicity (1 = African American, 0 = otherwise), education (1 = high school graduate, 0 = otherwise), previous children (1 = yes, 0 = otherwise), and trimester prenatal care began (1 = first, 2 = second, 3 = third). For a theoretical discussion of the likelihood function used for ordinal logistic regression, see Appendix 1 in the Armstrong and Sloan paper.[39]

[a]For before pregnancy, likelihood ratio model $\chi^2_{(6df)} = 178.45$, $P < .0001$; for during pregnancy, likelihood ratio model $\chi^2_{(6df)} = 245.64$, $P < .0001$.

[b]AOR = adjusted odds ratio, CI = confidence interval.

quent drinkers (27% vs 26%; OR = 1.03; 95% CI = 0.52, 2.04).

Table 4 presents crude bivariate associations between the number of substances used during pregnancy (zero, one, two, or three) and both violence and sociodemographic characteristics. The ANOVA/Cochran-Mantel-Haenszel statistic shows a significant association between violence and the number of substances used during pregnancy, with violence victims tending to use greater numbers of substances than nonvictims ($P < .001$). Table 4 also shows that significant differences in the number of substances used during pregnancy were found by ethnicity, education, age, previous childbirth, and trimester in which prenatal care began.

Another cumulative odds model was fit using ordinal logistic regression to assess the association between the number of substances used during pregnancy and violence, controlling for sociodemographic factors. This analysis resulted in essentially equal estimated odds ratios for the three possible groupings of the outcome (zero substances vs one, two, or three; zero or one substance vs two or three; and zero, one, or two substances vs three), thus supporting the proportional odds assumption. Table 3 shows that violence victims were significantly more likely than nonvictims to be in the more severe substance use categories during pregnancy, controlling for sociodemographic factors (OR = 3.28; 95% CI = 2.68, 4.02). Significant associations also were found between the number of substances used during pregnancy and ethnicity, with African Americans being less likely to be in the more severe categories; education, with high school graduates being less likely to be in the more severe categories; age, with older women being more likely to be in the more severe categories; and trimester in which prenatal care began, with women who started prenatal care later being more likely to be in the more severe categories.

**TABLE 4—Characteristics of Women (n = 2092) Using Various Numbers of Substances during Pregnancy, by Violence and Sociodemographic Characteristics**

| | No. Substances | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0[a] | | 1[a] | | 2[a] | | 3[a] | | |
| | No. | % | No. | % | No. | % | No. | % | P[b] |
| Violence victim | | | | | | | | | <.001 |
| Yes | 268 | 49 | 208 | 38 | 59 | 11 | 15 | 3 | |
| No | 1181 | 77 | 297 | 19 | 46 | 3 | 18 | 1 | |
| Ethnicity | | | | | | | | | .043 |
| African American | 840 | 74 | 214 | 19 | 64 | 6 | 24 | 2 | |
| Other | 609 | 64 | 291 | 31 | 41 | 4 | 9 | 1 | |
| Education | | | | | | | | | <.001 |
| High school graduate | 1185 | 73 | 360 | 22 | 69 | 4 | 20 | 1 | |
| Nongraduate | 264 | 58 | 145 | 32 | 36 | 8 | 13 | 3 | |
| Age | | | | | | | | | <.001 |
| 20–29 | 1188 | 71 | 392 | 23 | 69 | 4 | 24 | 1 | |
| 30–39 | 261 | 62 | 113 | 27 | 36 | 9 | 9 | 2 | |
| Children | | | | | | | | | <.001 |
| Yes | 856 | 66 | 353 | 27 | 72 | 6 | 23 | 2 | |
| No | 593 | 75 | 152 | 19 | 33 | 4 | 10 | 1 | |
| Trimester prenatal care began | | | | | | | | | <.001 |
| First | 784 | 73 | 249 | 23 | 32 | 3 | 6 | <1 | |
| Second | 526 | 66 | 195 | 25 | 52 | 7 | 19 | 2 | |
| Third | 139 | 61 | 61 | 27 | 21 | 9 | 8 | 3 | |

[a]0 = did not use cigarettes, alcohol, or drugs; 1 = used cigarettes, alcohol, or drugs; 2 = used cigarettes and alcohol, cigarettes and drugs, or alcohol and drugs; 3 = used cigarettes, alcohol, and drugs.

[b]*P* value of ANOVA/Cochran-Mantel-Haenszel statistic.

### *Violence and Continuation of Substance Use during Pregnancy*

Among the 1290 women who used one or more substances before pregnancy,

**TABLE 5—Characteristics of Women Who Continued or Quit Substance Use during Pregnancy (n = 1290), by Violence and Sociodemographic Characteristics**

| | Continued | | Quit | | |
|---|---|---|---|---|---|
| | No. | % | No. | % | OR (95% CI)[a] |
| Violence victim | | | | | 2.59 (2.04, 3.30) |
| Yes | 280 | 65 | 150 | 35 | |
| No | 360 | 42 | 500 | 58 | |
| Ethnicity | | | | | 0.62 (0.49, 0.77) |
| African American | 301 | 44 | 384 | 56 | |
| Other | 339 | 56 | 266 | 44 | |
| Education | | | | | 0.47 (0.36, 0.62) |
| High school graduate | 447 | 45 | 540 | 55 | |
| Nongraduate | 193 | 64 | 110 | 36 | |
| Age | | | | | 0.60 (0.45, 0.79) |
| 20–29 | 484 | 47 | 545 | 53 | |
| 30–39 | 156 | 60 | 105 | 40 | |
| Children | | | | | 2.17 (1.73, 2.73) |
| Yes | 445 | 57 | 333 | 43 | |
| No | 195 | 38 | 317 | 62 | |
| Trimester prenatal care began[b] | | | | | |
| First | 287 | 43 | 376 | 57 | |
| Second | 263 | 55 | 218 | 45 | |
| Third | 90 | 62 | 56 | 38 | |

[a]OR = unadjusted odds ratio; CI = confidence interval.
[b]*P* value of the ANOVA/Cochran-Mantel-Haenszel statistic = <.001.

**TABLE 6—Results of the Logistic Regression Model of Women's (n = 1290) Continuation of Substance Use during Pregnancy[a]**

| | Parameter Estimate | Standard Error | AOR (95% CI)[b] |
|---|---|---|---|
| Violence victim | 0.8282 | 0.1280 | 2.29 (1.78, 3.74) |
| Ethnicity | −0.5278 | 0.1207 | 0.59 (0.47, 0.75) |
| Education | −0.6266 | 0.1465 | 0.53 (0.40, 0.71) |
| Age | 0.0625 | 0.0141 | 1.06 (1.04, 1.09) |
| Children | 0.4919 | 0.1296 | 1.64 (1.27, 2.11) |
| Trimester prenatal care began | 0.3554 | 0.0890 | 1.43 (1.20, 1.70) |

*Note.* The following coding scheme was used for this analysis: continuation of substance use (1 = continued, 0 = otherwise), violence (1 = yes, 0 = otherwise), age (in years), ethnicity (1 = African American, 0 = otherwise), education (1 = high school graduate, 0 = otherwise), previous children (1 = yes, 0 = otherwise), and trimester prenatal care began (1 = first, 2 = second, 3 = third).
[a]Likelihood ratio model $\chi^2_{(6df)} = 170.65$, $P = .0001$.
[b]AOR = adjusted odds ratio; CI = confidence interval.

approximately half continued to do so during pregnancy while approximately half quit all substance use during pregnancy. Table 5 presents crude bivariate associations between the continuation of substance use during pregnancy and both violence and sociodemographic characteristics. Among women who used at least one substance before pregnancy, violence victims were significantly more likely than nonvictims to continue substance use during pregnancy (65% vs 42%; OR = 2.59; 95% CI = 2.04, 3.30). Continuation of substance use during pregnancy also was significantly related to ethnicity, education, age, previous childbirth, and trimester in which prenatal care began.

Logistic regression analysis was used to model continuation of substance use during pregnancy among the 1290 women who used substances before pregnancy. Continuation of substance use was modeled as a function of violence exposure and the sociodemographic factors of ethnicity, education level, age, previous childbirth, and trimester in which prenatal care began. Table 6 shows that, after we controlled for sociodemographic factors, violence victims were significantly more likely than nonvictims to continue to use substances during pregnancy (OR = 2.29; 95% CI = 1.78, 3.74). Continuation of substance use during pregnancy also was significantly related to ethnicity, with African Americans being less likely to continue; to education, with high school graduates being less likely to continue; to age, with older women being more likely to continue; to previous childbirth, with women with children being more likely to continue; and to trimester in which prenatal care began, with women who started prenatal care later being more likely to continue.

## *Discussion*

Similar to past research, this study found that approximately one quarter of the prenatal patients experienced violence during their lifetimes, with approximately 3% experiencing violence during pregnancy.

Substance use in the year before pregnancy was common, with more than 60% of the women using one or more substances before pregnancy (50% alcohol, 39% cigarettes, and 13% drugs). However, many women quit using substances (especially alcohol) during pregnancy, so that, during pregnancy, only 31% used one or more substances (8% alcohol, 27% cigarettes, and 4% drugs). These rates of substance use are in line with those found in large, nationally representative samples of women.[40–43]

This study found strong positive associations between violence and substance use. Similar to past research, it found that, compared with nonvictims, violence victims were significantly more likely to smoke, to drink alcohol, and to use illegal drugs both before and during pregnancy. This study also extends past research by showing that violence was associated with the number of substances (zero, one, two, or three) used by women before and during pregnancy, with ordinal logistic regression analyses showing that violence victims were significantly more likely than nonvictims to be in the more severe substance use categories, controlling for sociodemographic factors. Furthermore, this study found that, among women who used at least one substance before pregnancy, violence was a risk factor for continuation of substance use during

pregnancy, with logistic regression analysis showing that violence victims were significantly more likely than nonvictims to continue using substances during pregnancy, controlling for sociodemographic factors.

This study's findings may be understood in light of past clinical and empirical observations. Although there is no consensus concerning a causal pathway between violence victimization and substance use, clinical reports suggest that some women turn to substances to alleviate the physical and mental pain associated with violence.[44] Research supports these clinical impressions in that some women have been shown to initiate substance use in response to battering,[24] and chemically dependent women have reported using substances to medicate their feelings of distress and fear resulting from violence.[45] Since many women in this study were violated by their loved ones (husbands, boyfriends), it is conceivable that these victimized women used multiple substances as a way of coping with the trauma associated with violence. Other research shows that substance cessation is more likely to occur within the context of a healthy and supportive family environment.[46] Even though all the women in this study may have wanted to quit using substances during pregnancy, it is likely that victimized women did not have the supportive social environments that would help to bolster their resolve. Furthermore, since pregnancy is a stressor for many women, especially women in problem relationships, it may have been impossible for women who used substances to give up one of their strategies for dealing with stress (namely, using substances) during pregnancy. More research is needed in this area to better understand the social and situational contexts in which victimized women turn to substance use.

This study had several methodological limitations. Assessments of violence and substance use were based solely on women's self-reports, which may have underestimated the true extent of these socially stigmatized behaviors; therefore, this study would have benefited from additional information sources concerning violence exposure (e.g., police records concerning domestic assaults) and substance exposure (e.g., urine tests of substance use). Further, this study assessed women during their first prenatal visit, which often occurred in their first trimester; therefore, any violence and substance use that occurred only later in pregnancy would not have been detected. In addition, this study did not assess the severity of violence experienced by women, nor the possible recurrent nature of the violence. It is reasonable to expect that women who suffer the most severe and repeated episodes of violence will be at the greatest risk of using substances to cope with these problems. Although this study shows that violence was associated with the use of multiple substances, the relatively small sample sizes of subgroups made it impossible to examine whether violence was more or less associated with particular combinations of substances (e.g., use of cigarettes and alcohol vs use of cigarettes and illegal drugs). Finally, this study focused on the relatively poor prenatal patients of a North Carolina health department; thus, the findings may not be generalizable to other populations.

Despite the above limitations, the results of this study may inform both clinical practice and health policy. The finding that many women use substances before pregnancy underlines the need for greater health education efforts focused on the preconceptional health of women, especially given that few women plan their pregnancies. Since no clear profiles of female violence victims or substance users exist, health care providers in both private and public practice should ensure that all women are routinely screened for violence and substance use. Health care providers are therefore urged to view women's health care visits, including prenatal visits, as "windows of opportunity" to ask about use of substances as well as experiences with violence.

Since violence as well as substance use may place women and their children at increased risk, it is important that violence victims and/or substance users be provided with appropriate interventions.[6] Clinicians should incorporate substance use cessation programs into their services, and they should strengthen their working relationships with the substance abuse treatment services and resources (domestic violence programs, battered women's shelters, etc.) to which violence victims may be referred. Further, clinicians should be aware of the policies of local women's shelters since many shelters will not accept substance-abusing women. Clinicians and policymakers should work together with community service providers to develop needed interventions for the highest-risk women—those who suffer from both substance problems and violent relationships. Because violence and high levels of alcohol or drug use are often associated with a wider set of potentially harmful environmental conditions, a broad range of health, social, and legal services may be needed to ensure the family's health.[5] Education of health professionals concerning the problems of violence against women and women's substance use will be a first step toward addressing this complex problem. □

## Acknowledgments

This project was funded by the North Carolina Department of Mental Health, Developmental Disability, Substance Abuse Services, Alcohol and Drug Section, and, in part, by grant MCJ-107 from the Maternal and Child Health Bureau (Title V, Social Security Act), Health Resources and Services Administration, Department of Health and Human Services.

Earlier versions of this paper were presented at the 122nd Annual Meeting of the American Public Health Association on November 2, 1994, in Washington, DC, and at the 4th International Family Violence Conference on July 22, 1995, in Durham, NH.

The authors wish to thank Dr Ira Chasnoff and Dr Scott Azuma for their comments concerning the development of the screening procedure used in this study, the staff of the Step by Step Program and the Wake County Department of Health in North Carolina for their participation in this project, Ms Jennifer Ashlock, Ms Stacy Racine Lynch, and Ms Sherry Rhodes for their assistance in producing this manuscript, and the anonymous reviewers of this Journal who kindly offered many suggestions that helped to improve this report.

## References

1. Gelles RJ. Violence and pregnancy: are pregnant women at greater risk of abuse? *J Marriage Fam.* 1988;50:841–847.
2. Hillard PJA. Physical abuse in pregnancy. *Obstet Gynecol.* 1985;66:185–190.
3. Helton AS, McFarlane J, Anderson ET. Battered and pregnant: a prevalence study. *Am J Public Health.* 1987;77:1337–1339.
4. Helton AS, Snodgrass FG. Battering during pregnancy: intervention strategies. *Birth.* 1987;14:142–147.
5. Amaro H, Fried LE, Cabral H, Zuckerman B. Violence during pregnancy and substance use. *Am J Public Health.* 1990;80:575–579.
6. Berenson AB, Stiglich NJ, Wilkinson GS, Anderson GD. Drug abuse and other risk factors for physical abuse in pregnancy among White non-Hispanic women. *Am J Obstet Gynecol.* 1991;164:1491–1499.
7. Bayatpour M, Wells RD, Holford S. Physical and sexual abuse as predictors of substance use and suicide among pregnant teenagers. *J Adolesc Health.* 1992;13:128–132.
8. McFarlane J, Parker B, Soeken K, Bullock L. Assessing for abuse during pregnancy: severity and frequency of injuries and associated entry into prenatal care. *JAMA.* 1992;267:3176–3178.
9. Berenson AB, San Miguel VV, Wilkinson GS. Prevalence of physical and sexual assault in pregnant adolescents. *J Adolesc Health.* 1992;13:466–469.

10. Parker B, McFarlane J, Soeken K. Abuse during pregnancy: effects of maternal complications and birth weight in adults and teenage women. *Obstet Gynecol.* 1994;84: 323–328.
11. Sampselle CM, Petersen BA, Murtlant TL, Oakley DJ. Prevalence of abuse among pregnant women choosing certified nurse-midwife or physician providers. *J Nurse Midwifery.* 1992;37:269–273.
12. Stewart DE, Cecutti A. Physical abuse in pregnancy. *Can Med Assoc J.* 1993;149: 1257–1263.
13. Dye TD, Tolliver NJ, Lee RV, Kenny CJ. Violence, pregnancy and birth outcomes in Appalachia. *Pediatr Perinat Epidemiol.* 1995; 4:35–47.
14. Gazmararian JA, Adams MM, Saltzman JE, et al. The relationship between pregnancy intendedness and physical violence in mothers of newborns. *Obstet Gynecol.* 1995;85:1031–1038.
15. Campbell JC, Poland ML, Waller JB, Ager J. Correlates of battering during pregnancy. *Res Nurs Health.* 1992;15:219–226.
16. Gielen AC, O'Campo PJ, Faden RR, Kass NE, Xue X. Interpersonal conflict and physical violence during the childbearing year. *Soc Sci Med.* 1994;39:781–787.
17. Webster J, Sweett S, Stolz TA. Domestic violence in pregnancy: a prevalence study. *Med J Aust.* 1994;161:466–470.
18. Council on Scientific Affairs, American Medical Association. Violence against women: relevance for medical practitioners. *JAMA.* 1992;267:3184–3189.
19. Stark E, Flitcraft A, Zuckerman B, Grey A, Robenson J, Frazier W. Wife abuse in the medical setting. *Domestic Violence.* 1981;7: 7–41.
20. Walker L. *The Battered Woman Syndrome.* New York, NY: Springer, 1984.
21. Hilberman E. Overview: the wife-beater's wife: reconsidered. *Am J Psychiatry.* 1980; 137:1336.
22. Stets JE, Straus MA. Gender differences in reporting of marital violence and its medical and psychological consequences. In: Straus MA, Gelles RJ, eds. *Physical Violence in American Families.* New Brunswick, NJ: Transaction Publishers; 1990:151–165.
23. Lentzner HR, DeBerry MM. *Intimate Victims: A Study of Violence among Friends and Relatives.* Washington, DC: US Dept of Justice, Bureau of Justice Statistics; 1980.
24. Stark E, Flitcraft A, Frazier W. Medicine and patriarchal violence: the social construction of a "private" event. *Int J Health Serv.* 1979;9:461–493.
25. Burge SK. Violence against women as a health care issue. *Fam Med.* 1989;21:368–373.
26. Senay EC. Drug abuse and public health: a global perspective. *Drug Safety.* 1991; 1(suppl):1–65.
27. Bullock LF, McFarlane J. The birth-weight/battering connection. *Am J Nurs.* 1989;89: 1153–1155.
28. Morey MA, Begleiter ML, Harris DJ. Profile of a battered fetus. *Lancet.* 1981;2: 1294–1295.
29. Zuckerman B. Marijuana and cigarette smoking during pregnancy: neonatal effects. In: Chasnoff IJ, ed. *Drugs, Alcohol, Pregnancy, and Parenting.* Hingham, Mass: Kluwer Academic Press; 1988:73–88.
30. Chasnoff IJ. Cocaine: effects on pregnancy and the neonate. In: Chasnoff IJ, ed. *Drugs, Alcohol, Pregnancy, and Parenting.* Hingham, Mass: Kluwer Academic Press; 1988: 97–103.
31. Weiner L, Morse BA. FAS: clinical perspectives and prevention. In: Chasnoff IJ, ed. *Drugs, Alcohol, Pregnancy, and Parenting.* Hingham, Mass: Kluwer Academic Press; 1988:127–148.
32. Frank DA, Zuckerman BS, Amaro H, et al. Cocaine use during pregnancy: prevalence and correlates. *Pediatrics.* 1988;82:888–895.
33. Stark E, Flitcraft A. Violence among intimates: an epidemiological review. In: Van Hasselt VB, Morrison RL, Bellack AS, Hersen M, eds. *Handbook of Family Violence.* New York, NY: Plenum Press; 1988:293–318.
34. Potter-Efron RT, Potter-Efron PS. *Aggression, Family Violence and Chemical Dependency.* Binghamton, NY: Haworth Press; 1990.
35. Forastier F, Agabiti N, Corbo GM, et al. Passive smoking as a determinant of bronchial responsiveness in children. *Am J Respir Crit Care Med.* 1994;149:365–370.
36. Berenson AB, San Miguel VV, Wilkinson GS. Violence and its relationship to substance use in adolescent pregnancy. *J Adolesc Health.* 1992;13:470–474.
37. Zuckerman B. Drug-exposed infants: understanding the medical risk. In: Behrman RE, ed. *Drug Exposed Infants, The Future of Children.* Los Altos, Calif: The Center for the Future of Children, The David and Lucille Packard Foundation; 1991;1:26–35.
38. Landis RJ, Heyman ER, Koch GG. Average partial association in three-way contingency tables: a review and discussion of alternative tests. *Int Stat Rev.* 1978;46:237–254.
39. Armstrong BG, Sloan M. Ordinal regression models for epidemiologic data. *Am J Epidemiol.* 1989;129:191–204.
40. National Institute on Drug Abuse. *National Household Survey on Drug Abuse: 1990 Population Estimates.* Rockville, Md: US Dept of Health and Human Services; 1991. DHHS publication ADM 91-1732.
41. *Healthy People 2000, National Health Promotion and Disease Prevention Objectives, Full Report with Commentary.* Washington, DC: US Dept of Health and Human Services, Public Health Service; 1991:364–390. DHHS publication PHS 91-50212.
42. Pamuk ER, Mosher WD. Health aspects of pregnancy and childbirth, United States, 1982. *Vital Health Stat [23].* 1988; 16. DHHS publication PHS 89-1992.
43. National Institute on Drug Abuse. *Press Release from the National Health and Pregnancy Survey.* Rockville, Md: National Institute on Drug Abuse Information Clearinghouse; September 1994.
44. Campbell J, Fishwick N. Abuse of female partners. In: Campbell J, Humphreys J, eds. *Nursing Care of Survivors of Family Violence.* St. Louis, Mo: Mosby; 1993:68–104.
45. Woodhouse LD. An exploratory study of the use of life history methods to determine treatment needs for female substance abusers. *Response.* 1990;13:12–15.
46. Stall R. An examination of spontaneous remission from problem drinking in the bluegrass region of Kentucky. *J Drug Issues.* 1983;13:191–206.